

PHOTONUCLEAR REACTIONS: SYSTEMATICAL DISAGREEMENTS, METHODS OF THEIR OVERCOMING AND PHYSICAL CONSEQUENCES

B. S. Ishkhanov¹, V. V. Chesnokov², N. N. Peskov², M. E. Stepanov¹, V. V. Varlamov²

¹ *Physics Faculty, Lomonosov Moscow State University*

² *Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University*

Majority of photonuclear reaction cross section data has been obtained in experiments using electron bremsstrahlung and quasimonoenergetic photons produced by annihilation in flight of relativistic positrons, many last kind data obtained at Livermore (USA) and Saclay (France). Significant discrepancies between photonuclear reaction (both total and partial) cross sections obtained in various experiments have been discussed /1 – 4/. It was found out that as a rule total photoneutron reaction cross sections obtained at Livermore differ (being smaller in amplitude) from that of other laboratories: Livermore total photoneutron (g,xn) reactions cross section absolute values must used being multiplied /3/ by 1.12.

Additionally it was found out /1/ that disagreements of partial reactions (g,n) and (g,2n) cross sections, obtained at Livermore and Saclay using neutron multiplicity sorting procedure are much more ($\sim 30 - 40\%$) and as a rule have opposite directions. These disagreements were interpreted as the result of difference of neutron multiplicity sorting procedures used: at Saclay incorrect transmission of the part of (g,2n) reaction cross section into the (g,n) reaction cross section took place. The special method /1, 4/ was used to move the data into consistence. Its idea is that correspondent “false” part of (g,n) reaction cross section is recalculated and transmitted back into (g,2n) reaction cross section.

Joint analysis of the (g,xn), (g,n) and (g,2n) reaction cross section data obtained at both laboratories mentioned was carried out /4/ for 19 (for 7 – at first) nuclei ⁵¹V, ⁷⁵As, ⁸⁹Y, ⁹⁰Zr, ¹¹⁵In, ^{116,117,118,120,124}Sn, ¹²⁷I, ¹³³Cs, ¹⁵⁹Tb, ¹⁶⁵Ho, ¹⁸¹Ta, ¹⁹⁷Au, ²⁰⁸Pb, ²³²Th, ²³⁸U and evaluated consistent data were obtained.

President of Russia grant N SS-1619.2003.2 and RBFR grant N 03-07-90431.

1. E.Wolyneec, M.N.Martins. Revista Brasileira Fisica, 17 (1987) 56.
2. B.L.Berman, R.E.Pywell, S.S.Dietrich, M.N.Thompson, K.G.McNeill, J.W.Jury. Phys.Rev., C36 (1987) 1286.
3. V.V.Varlamov, B.S.Ishkhanov. Study of Consistency Between (g,xn), [(g,n) + (g,np)] and (g,2n) Reaction Cross Sections Using Data Systematics. Vienna, Austria. INDC(CCP)-433, IAEA NDS, Vienna, Austria, 2002.
4. V.V.Varlamov, N.N.Peskov, D.S.Rudenko, M.E.Stepanov. Photoneutron Reaction Cross Sections in Experiments with Beams of Quasimonoenergetic Annihilation Photons. Preprint SINP MSU 2003-2/715, Moscow, 2003.